Female Scarcity Reduces Women's Marital Ages and Increases Variance in Men's Marital Ages

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Abstract: When women are scarce in a population relative to men, they have greater bargaining power in romantic relationships and thus may be able to secure male commitment at earlier ages. Male motivation for long-term relationship commitment may also be higher, in conjunction with the motivation to secure a prospective partner before another male retains her. However, men may also need to acquire greater social status and resources to be considered marriageable. This could increase the variance in male marital age, as well as the average male marital age. We calculated the Operational Sex Ratio, and means, medians, and standard deviations in marital ages for women and men for the 50 largest Metropolitan Statistical Areas in the United States with 2000 U.S Census data. As predicted, where women are scarce they marry earlier on average. However, there was no significant relationship with mean male marital ages. The variance in male marital age increased with higher female scarcity, contrasting with a non-significant inverse trend for female marital age variation. These findings advance the understanding of the relationship between the OSR and marital patterns. We believe that these results are best accounted for by sex specific attributes of reproductive value and associated mate selection criteria, demonstrating the power of an evolutionary framework for understanding human relationships and demographic patterns.

Keywords: Operational Sex Ratio, sexual selection, marital age, sex differences

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Introduction

Research documents sex differences in average marital age across many different cultures (Buss, 1989; Fieder and Huber, 2007; Kenrick and Keefe, 1992; Kenrick, Keefe, Gabrielidis, and Cornelius, 1996; Otta, Queiroz, Campos, da Silva, and Silveira, 1999).

This difference represents a male preference for younger women and a female preference for older men – corresponding to the sex-specific attributes of reproductive fitness. Women invest physiologically in their offspring through gestation and lactation, and faced considerable mortality risk from childbirth before modern medicine and public health measures (Guyer, Freedman, Strobino, and Sondik, 2000). It is in a male's best reproductive interest to mate with highly fecund females. Female fertility declines with age substantially more so than male fertility, so men tend to prefer younger women as potential marriage partners (Buss, 1989; Otta et al., 1999).

Men typically invest resources in their partner and offspring. Before fungible currencies, this investment took the form of the acquisition of food and shelter, as well as physical care and protection. Thus, women prefer males with high socioeconomic status (SES), those with an abundance of acquired resources, as marriage partners (Buss, 1989; Hopcroft, 2006; Otta et al., 1999). Both marriage and divorce rates in the United States demonstrate the preference for high SES in male marital partners – male unemployment is negatively correlated with both marriage rates and divorce rates (South and Lloyd, 1992a; South and Spitze, 1986). Previous research has also found a decrease in female non-marital fertility rates as male unemployment rates increase (South and Lloyd, 1992b).

Higher SES is associated with older male ages because of the time necessary to acquire and accrue social status and resources – attributes related to mate preferences that have been found in the marital practices of several cultures in different areas of the world (Buss, 1989; Fieder and Huber, 2007; Kenrick and Keefe, 1992; Otta et al., 1999). Fieder and Huber (2007) found that the maximum number of offspring produced in a marriage occurred when the female was six years younger (as reported by Swedish males) and when the male was four years older (as reported by Swedish females). Although these findings have sparked a heated debate, especially over the sex-specific aspects of age and maximum offspring production (Bookstein, Fieder, and Huber, 2008; Boyko, 2008; Fieder, Huber, and Bookstein, 2008; Kokko, 2008a, 2008b; Lindqvist, Cesarini, and Wallace, 2008), the general findings provide insight on the sex difference in marital age preference. Ultimately, males prefer younger females, while females prefer older males, as optimal marital partners.

Operational Sex Ratio

One of the most important factors influencing marriage rates is the Operational Sex Ratio (OSR), originally defined as the number of sexually active males per 100 sexually receptive females (Emlen and Oring, 1977). If the OSR is 100, the population is perfectly balanced between the sexes. However, in environments where one sex outnumbers the other, the rarer sex has a reproductive advantage (Fisher, 1958). Members of the scarce sex are able to be more selective of their partners whereas the other sex faces greater intrasexual competition in securing a potential mate (Kvarnemo and Ahnesjö, 1996).

When the OSR is male biased, available men outnumber available women and the greater degree of female choice will increase the male social status and resource potential necessary for securing female partners. A larger number of available males leads to an increase in female marital rates (South and Lloyd, 1992a), and with greater bargaining power, women can secure mates with higher SES, higher fidelity, and a greater willingness

to invest in offspring (Pedersen, 1991; Pollet and Nettle, 2008). Thus, men with lower SES may have an especially difficult time securing a marriage partner in male biased environments (Pollet and Nettle, 2008). However, a larger proportion of younger men are married in male biased populations compared to female biased populations, indicating a greater willingness for earlier commitment to long-term relationships (Kruger and Schlemmer, 2009).

Conversely, in an environment where the OSR is female biased, males tend to pursue short-term mating as long as possible (Kruger and Schlemmer, 2009). The lower intrasexual competition associated with a relative shortage of male competitors allows them to decrease resource expenditures and avoid marital commitments. Males can continue short-term mating strategies much longer than in a less female biased population. The female biased OSR has been linked to increased divorce rates, family conflict, out-of-wedlock births, and violent crimes (Barber, 2000, 2001, 2003; Guttentag and Secord, 1983; Pedersen, 1991; South and Lloyd, 1992a). In addition, women have greater difficulties in obtaining their first marriage (Lichter, Kephart, McLaughlin, and Landry, 1992).

Previous research on imbalanced OSRs has led to other conclusions regarding marital patterns. For instance, South and Lloyd (1992a) found that male-biased environments were not only associated with a decrease in birth rates of illegitimate children, but also increases in both marriage and divorce rates. The increase in marriage rates, coupled with the decrease in illegitimacy rates, supports the notion that males are more likely to exhibit long-term mating behaviors in male-biased environments. However, the increase in divorce rates suggests that an abundance of available males may increase a female's marital opportunities, possibly leading to mate switching even after marriage.

Hypotheses

In male biased environments, women may encounter many more male suitors and may also secure a male willing to commit to marriage at an earlier age than women in sex-balanced or female biased environments. The increased power of female choice may increase the average marital age of men, as the men may need to acquire higher social status and a greater extent of resources. Simultaneously, men may be more willing to enter into committed relationships at earlier ages when women are scarce, and these divergent influences would lead to greater variance in male marital age. Because of this divergence, the net effect of the OSR on average male marital age is likely to be weaker than that for average female marital age. The truncated plausible range for male age in younger marriages compared to the possible age range in older male marriages may lead to a net result of older male marriages on average. The present study aims to further our understanding of human marital commitments in sex-biased populations by testing the following hypotheses:

Hypothesis 1: In populations where women are relatively scarce, the average marital age of women will be significantly lower than in sex-balanced or female biased populations.

Hypothesis 2: In populations where women are relatively scarce, the variance in male marital age will be higher than in sex-balanced or female biased populations.

Hypothesis 3: In populations where women are relatively scarce, the average marital age of men will be somewhat higher than in sex-balanced or female biased populations.

Materials and Methods

The Operational Sex Ratio (OSR) in humans is operationally defined as the ratio of unmarried men to unmarried women, multiplied by 100. Thus, an OSR of 100 indicates a balance between available men and available women, a male biased OSR of 110 indicates 11 men available for every 10 women available. Using the SPSS 17.0 statistical package, we calculated the OSR of people between the ages of 18 and 64 years, and the means, medians, and standard deviations in marital ages for women and men for the 50 largest Metropolitan Statistical Areas (MSAs) in the United States with year 2000 Census data (U.S Census, 2001). The 18-64 years-old age cut-off was used in calculating the OSR because this is the age range from the legal definition of adulthood age until traditional retirement age in the USA. We used the top 50 MSAs because this sample has previously demonstrated adequate statistical power for other similar demographic analyses (Kruger and Schlemmer, 2009). We examined the relationship between the OSR and marital age indicators both directly (Zero-Order) and controlling for median household income, median male age, median female age, proportion Black or African American, and proportion Hispanic or Latino in each MSA (Partial, see Table 1). We controlled for income and race because of their potential influence on marital behavior. South (1993) found that African-American men and women tend to desire marriage less than Caucasian men and women, whereas Hispanic men have an increased desire to marry compared to Caucasian men (though Hispanic women do not differ from Caucasian women). In addition, income may have a strong influence on marital age because, as South and Lloyd (1992a) discussed, when males are unemployed they seem to be less likely to marry but also less likely to divorce.

Results

The OSR for individuals ages 18 to 64 ranged from 88 in Birmingham, AL and Memphis, TN, to 116 in Las Vegas, NV ($M = 99$, $SD = 7$). See Table 2 in the Appendix for the descriptives of each MSA. As predicted, when women are scarce they marry earlier on average (see Figure 1) and the variance in male marital age increased, however there was no significant relationship with male marital ages (see Figure 2), though the trend was for earlier marriages. See Table 1 for the correlations.

Table 1. Correlations between the OSR 18-64 and the mean male and female marital ages, median male and female marital ages, and variance in male marital age

	Marital Age					
	Male			Female		
	M	*Md*	*SD*	*M*	*Md*	*SD*
Zero-Order (*df* = 50)	-.26	-.10	.57**	-.53**	-.48*	-.20
Partial (*df* = 43)	-.14	.09	.55**	-.35*	-.14	-.08

* Significant at the $p < .01$ level, ** Significant at the $p < .001$ level.

Figure 1. Mean female marital age by MSA Operational Sex Ratio for ages 18-64
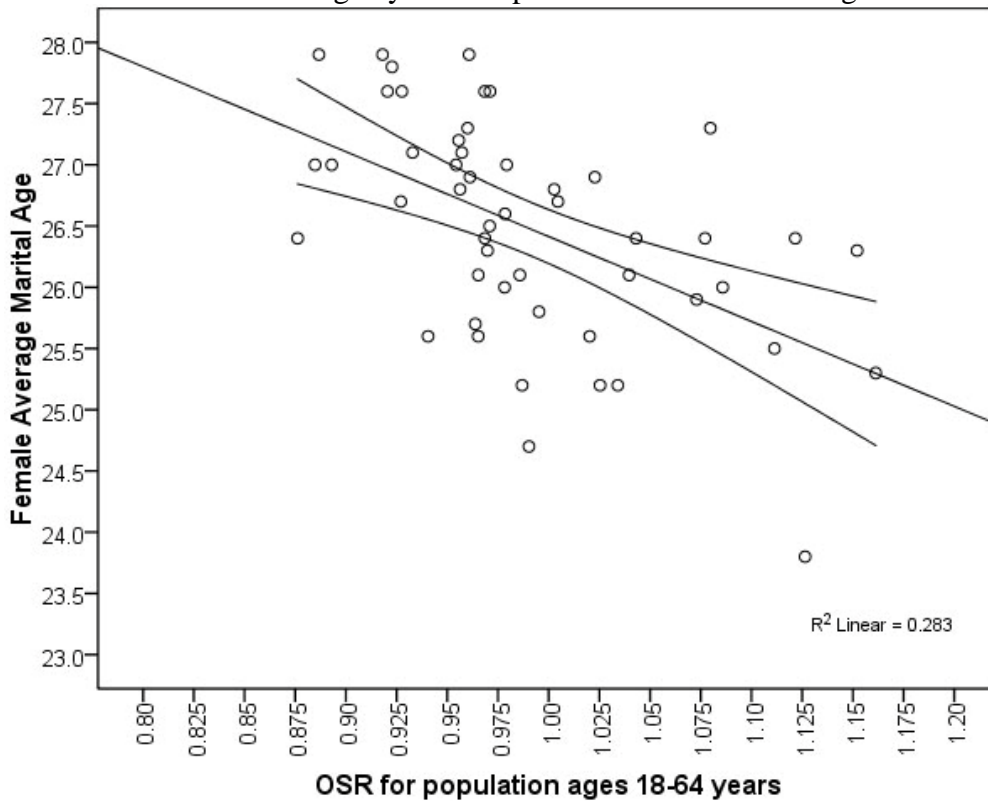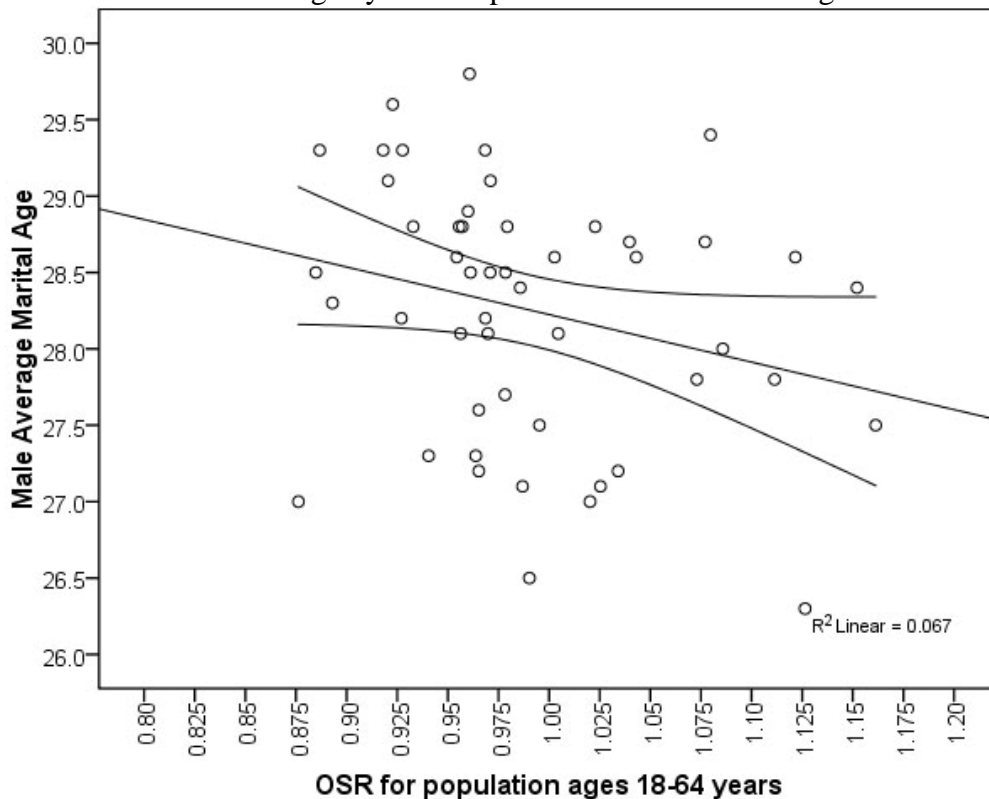
Figure 2. Mean male marital age by MSA Operational Sex Ratio for ages 18-64

Discussion

The purpose of the present study was to examine the relationship between an imbalanced Operational Sex Ratio (OSR) and marital ages. When the OSR becomes male biased, females are presented with an abundance of male suitors, which enables greater selectivity (Pedersen, 1991; Pollet and Nettle, 2008). As predicted, male abundance was significantly correlated with earlier mean and median female marital ages. This is likely due to a greater degree of female choice, higher male motivation for commitment to long-term relationships, and motivation to prevent a prospective female partner from being lost to a competitor (Kvarnemo and Ahnesjö, 1996).

Female scarcity was also correlated with a greater divergence in male marital ages, supporting our second prediction. Males who are able to secure marriages with females earlier in life may be more motivated to do so, yet other males need additional time to display characteristics making them desirable as long-term mates. Thus, in male biased populations, there will be both more men who are more similar to their wives in age, and more men who are considerably older than their wives. This contrasts with a non-significant inverse trend for female marital age variation.

We did not find a significant relationship between female scarcity and average male marital age. The trend suggests that the more men committing to marriages at earlier ages outweighs the longer durations of social status and resource accrual by men facing greater intrasexual competition and female selectivity. Our sample size may have been inadequate

to uncover weak net effects, and increasing the sample size may render this relationship statistically significant.

Limitations

The present study used 2000 U.S. Census data to calculate the OSR, mean and median male marital age, and mean and median female marital age. Census data do not indicate marital order, only whether an individual is married or not married. Because many marriages in the U.S. end in divorce, it is possible that the marital ages calculated in this study may not fully reflect the mean and median age of first marriage. However, the pattern of effects found in this study holds when also controlling for both the proportion of men and proportion of women who are divorced.

The correlational methodology used in this study does not allow us to directly infer a causal direction from the OSR to marital age. However, imbalanced OSRs in the metropolitan areas of the USA are believed to be primarily due to economic migration (Gwin, 2007). In the Northeastern USA, women have moved from predominantly rural areas to cities for white collar office careers. Men have moved to cities in the Western USA for technology-oriented careers (Gwin, 2007). These limitations open possibilities for future research to replicate our findings and strengthen understanding.

Conclusion and Future Implications

The implications of this study are immense in both their predictive power and relation to current social issues. For example, recent studies document the massive demographic imbalance of men and women in China, the world's largest national population. Because of the implementation of China's single-child law in 1979, combined with the preference for male children and the progression of ultrasound technology enabling sex-specific abortions, the OSR in China is increasingly male biased (Ding and Hesketh, 2006; Zhu and Hesketh, 2009). Although census data from 2005 reported an overall OSR of 119, some areas are reporting an OSR as high as 130. These researchers project that by the year 2020 there will be 24 million more men than women in China, and that if these men do not get married by age 40, they will stand a minimal chance of ever getting married, will have fewer resources, and will be reliant on social security in old age (Zhu and Hesketh, 2009).

As previous studies have indicated, women in China will become increasingly selective of their mates and men will need to commit to long-term relationships whenever possible to secure and retain a partner (Pedersen, 1991; Pollet and Nettle, 2008). Our results predict that in China (and anywhere else with a male biased population), women will marry younger and male marital ages will stratify. Overall, our study demonstrates the value of an evolutionary theoretical framework for predicting and understanding human relationships and demographic patterns.

References

Barber, N. (2000). The sex ratio as a predictor of cross-national variation in violent crime.

Cross-Cultural Research, 34, 264-282.

Barber, N. (2001). On the relationship between marital opportunity and teen pregnancy: The sex ratio question. *Journal of Cross-Cultural Psychology, 32*, 359-267.

Barber, N. (2003). The sex ratio and female marital opportunity as historical predictors of violent crime in England, Scotland, and the United States. *Cross-Cultural Research, 37*, 373-392.

Bookstein, F. L., Fieder, M., and Huber, S. (2008). Spouse age at the same rate: Reply to H. Kokko, 'Human parental age difference and offspring count: A comment on Fieder et al.'. *Biology Letters, 4*, 261.

Boyko, A. R. (2008). Optimal age difference cannot differ between monogamous males and females: A comment on Fieder and Huber. *Biology Letters, 4,* 82.

Buss, D. M. (1989). Sex difference in human mate preferences: Evolutionary hypotheses tested in 37 cultures. *Behavioral and Brain Sciences, 12*, 1-49.

Ding, Q. J., and Hesketh, T. (2006). Family size, fertility preferences, and sex ratio in China in the era of the one child family policy: Results from national family planning and reproductive health survey. *British Medical Journal, 333*, 371-373.

Emlen, S. T., and Oring, L. W. (1977). Ecology, sexual selection and the evolution of mating systems. *Science, 197*, 215-223.

Fieder, M., and Huber, S. (2007). Parental age difference and offspring count in humans. *Biology Letters, 3*, 689-691.

Fieder, M., Huber, S., and Bookstein, F. L. (2008). Reply to A. R. Boyko, 'Optimal age difference cannot differ between monogamous males and females: A comment on Fieder and Huber'. *Biology Letters, 4*, 83.

Fisher, R. A. (1958). *The genetical theory of natural selection* (2nd ed.). New York: Dover.

Guyer, B., Freedman, M. A., Strobino, D. M., and Sondik, E. J. (2000). Annual summary of vital statistics: Trends in the health of Americans during the 20th century. *Pediatrics, 106*, 1307-1317.

Guttentag, M., and Secord, P. F. (1983). *Too many women? The sex ratio question*. Beverly Hills, CA: Sage.

Gwin, P. (2007). Geography: Singles. *National Geographic, 211*, 22.

Hopcroft, R. L. (2006). Sex, status and reproductive success in the contemporary U.S. *Evolution and Human Behavior, 27*, 104–120.

Kenrick, D. T., and Keefe, R. C. (1992). Age preferences in mates reflect sex differences in human reproductive strategies. *Behavioral and Brain Sciences, 15*, 75-133.

Kenrick, D. T., Keefe, R. C., Gabrielidis, C., and Cornelius, J. S. (1996). Adolescents' age preferences for dating partners: Support for an evolutionary model of life- history strategies. *Child Development, 67*, 1499-1511.

Kokko, H. (2008a). Human parental age difference and offspring count: And we still do not know what women want. *Biology Letters, 4*, 259-260.

Kokko, H. (2008b). Males, females and the value of the toy model: A commentary on Bookstein et al. *Biology Letters, 4*, 349-350.

Kruger, D. J., and Schlemmer, E. (2009). Male scarcity is differentially related to male marital likelihood across the life course. *Evolutionary Psychology, 7*, 280-287.

Kvarnemo, C., and Ahnesjö, I. (1996). The dynamics of operational sex ratios and

competition for mates. *Trends of Ecology and Evolution, 11*, 404-408.

Lichter, D. T., Kephart, G., McLaughlin, D. K., and Landry, D. J. (1992). Race and the retreat from marriage: A shortage of marriageable men. *American Sociological Review, 57*, 781-99.

Lindqvist, E., Cesarini, D., and Wallace, B. (2008). Does parental age affect offspring count in humans? Comment on Fieder and Huber. *Biology Letters, 4*, 78-79.

Otta, E., Queiroz, R. D. S., Campos, L. D. S., da Silva, M. W. D., and Silveira, M. T. (1999). Age differences between spouses in a Brazilian marriage sample. *Evolution and Human Behavior, 20*, 99-103.

Pedersen, F. A. (1991). Secular trends in human sex ratios: Their influence on individual and family behavior. *Human Nature, 2*, 271–291.

Pollet, T. V., and Nettle, D. (2008). Driving a hard bargain: Sex ratio and male marriage success in a historical US population. *Biology Letters, 4*, 31-33.

South, S. J. (1993). Racial and ethnic difference in the desire to marry. *Journal of Marriage and the Family, 55*, 357-370.

South, S. J., and Lloyd, K. M. (1992a). Marriage opportunities and family formations: Further implications of imbalanced sex ratios. *Journal of Marriage and the Family, 54*, 440-451.

South, S. J., and Lloyd, K. M. (1992b). Marriage markets and nonmarital fertility in the United States. *Demography, 29*, 247-264

South, S. J., and Spitze, G. (1986). Determinants of divorce over the marital life course. *American Sociological Review, 51*, 583-590.

Zhu, W. X., and Hesketh, T. (2009). China's excess males, sex selective abortion, and one child policy: Analysis of data from 2005 national intercensus survey. *British Medical Journal, 338*, b1211.

Appendix

Table 2. Operational Sex Ratio (OSR) and mean and median marital ages (in years) for each Metropolitan Statistical Area (MSA)

MSA	OSR 18-64	Marital Age			
		Male		Female	
		Mean (*SD*)	Median	Mean (*SD*)	Median
Atlanta, GA	0.98	28.5 (2.3)	29.1	26.6 (1.3)	26.8
Austin-San Marcos, TX	1.12	28.6 (2.9)	29.1	26.4 (2.3)	26.2
Birmingham, AL	0.88	27.0 (0.2)	26.9	26.4 (3.1)	26.7

Boston-Worcester-Lawrence, MA-NH-ME-CT	0.96	29.8 (2.3)	30.3	27.9 (1.2)	28.0
Buffalo-Niagara Falls, NY	0.96	28.8 (3.0)	30.5	27.1 (2.8)	27.5
Charlotte-Gastonia-Rock Hill, NC-SC	1.00	27.5 (0.6)	26.0	25.8 (2.3)	25.4
Chicago-Gary-Kenosha, IL-IN-WI	0.98	28.8 (2.2)	29.3	27.0 (1.0)	27.1
Cincinnati-Hamilton, OH-KY-IN	0.97	28.1 (1.9)	27.9	26.3 (2.2)	26.0
Cleveland-Akron, OH	0.93	28.8 (1.5)	28.7	27.1 (1.9)	27.2
Columbus, OH	1.00	28.6 (2.2)	28.5	26.8 (2.3)	26.3
Dallas-Fort Worth, TX	1.03	27.2 (2.0)	26.8	25.2 (1.2)	24.8
Denver-Boulder-Greeley, CO	1.09	28.0 (2.5)	28.5	26.0 (1.7)	26.0
Detroit-Ann Arbor-Flint, MI	0.97	29.3 (2.2)	29.4	27.6 (1.3)	27.2
Hartford, CT	0.96	28.9 (1.3)	29.5	27.3 (2.6)	28.2
Houston-Galveston-Brazoria, TX	1.03	27.1 (2.5)	27.0	25.2 (1.3)	24.5
Indianapolis, IN	0.97	27.6 (1.5)	27.0	26.1 (2.2)	25.5
Jacksonville, FL	0.97	27.2 (1.9)	26.6	25.6 (2.9)	24.7
Kansas City, MO-KS	0.98	27.7 (0.8)	26.9	26.0 (2.3)	26.1
Las Vegas, NV-AZ	1.16	27.5 (3.8)	28.3	25.3 (2.5)	24.5
Los Angeles-Riverside-Orange County, CA	1.04	28.6 (3.1)	29.4	26.4 (0.7)	26.3
Louisville, KY-IN	0.95	28.6 (2.9)	29.0	27.0 (2.9)	26.1

Memphis, TN-AR-MS	0.88	28.5 (1.5)	28.7	27.0 (2.9)	27.2
Miami-Fort Lauderdale, FL	0.97	28.5 (2.7)	29.0	26.5 (1.6)	26.3
Milwaukee-Racine, WI	0.96	28.5 (1.3)	28.7	26.9 (2.3)	27.4
Minneapolis-St. Paul, MN-WI	1.02	28.8 (2.3)	29.3	26.9 (1.6)	27.0
Nashville, TN	0.96	27.3 (1.6)	26.6	25.7 (2.4)	25.0
New Orleans, LA	0.89	29.3 (0.2)	28.0	27.9 (2.8)	27.8
New York-New Jersey-Long Island, NY-NJ-CT-PA	0.92	29.6 (2.1)	30.4	27.8 (0.7)	28.3
Norfolk-Virginia Beach-Newport News, VA-NC	1.02	27.0 (2.8)	27.4	25. 6 (2.2)	24.6
Oklahoma City, OK	0.99	27.1 (2.4)	26.2	25.2 (2.8)	23.8
Orlando, FL	1.04	28.7 (2.3)	28.4	26.1 (2.4)	26.1
Philadelphia-Wilmington-Atlantic City, PA-NJ-DE	0.92	29.3 (1.9)	29.8	27.9 (1.2)	27.9
Phoenix-Mesa, AZ	1.11	27.8 (3.1)	28.1	25.5 (1.6)	25.0
Pittsburgh, PA	0.96	28.8 (2.1)	29.1	27.2 (2.0)	27.0
Portland-Salem, OR-WA	1.07	27.8 (2.6)	27.6	25.9 (2.0)	25.0
Providence-Fall River-Warwick, RI-MA	0.93	29.3 (2.0)	29.5	27.6 (2.7)	27.5
Raleigh-Durham-Chapel Hill, NC	0.96	28.1 (1.5)	27.8	26.8 (2.3)	26.3
Richmond-Petersburg, VA	0.89	28.3 (2.6)	28.9	27.0 (2.9)	26.3
Rochester, NY	0.97	29.1 (2.3)	29.7	27.6 (2.7)	27.4

Sacramento-Yolo, CA	0.97	28.2 (2.5)	28.1	26.4 (2.3)	25.6
St. Louis, MO-IL	0.93	28.2 (2.0)	28.2	26.7 (1.8)	26.2
Salt Lake City-Ogden, UT	1.13	26.3 (2.1)	25.3	23.8 (2.5)	23.2
San Antonio, TX	0.94	27.3 (1.6)	27.2	25.6 (2.4)	25.6
San Diego, CA	1.15	28.4 (3.5)	29.4	26.3 (1.6)	25.9
San Francisco-Oakland-San Jose, CA	1.08	29.4 (3.1)	30.6	27.3 (1.1)	27.5
Seattle--Tacoma-Bremerton, WA	1.08	28.7 (2.9)	28.8	26.4 (1.6)	25.9
Tampa-St. Petersburg-Clearwater, FL	0.99	28.4 (3.9)	29.0	26.1 (2.2)	25.1
Tucson, AZ	1.00	28.1 (3.9)	28.9	26.7 (3.6)	25.0
Tulsa, OK	0.99	26.5 (3.0)	25.9	24.7 (3.4)	22.9
Washington-Baltimore, DC-MD-VA-WV	0.92	29.1 (1.7)	29.5	27.6 (1.0)	27.8